

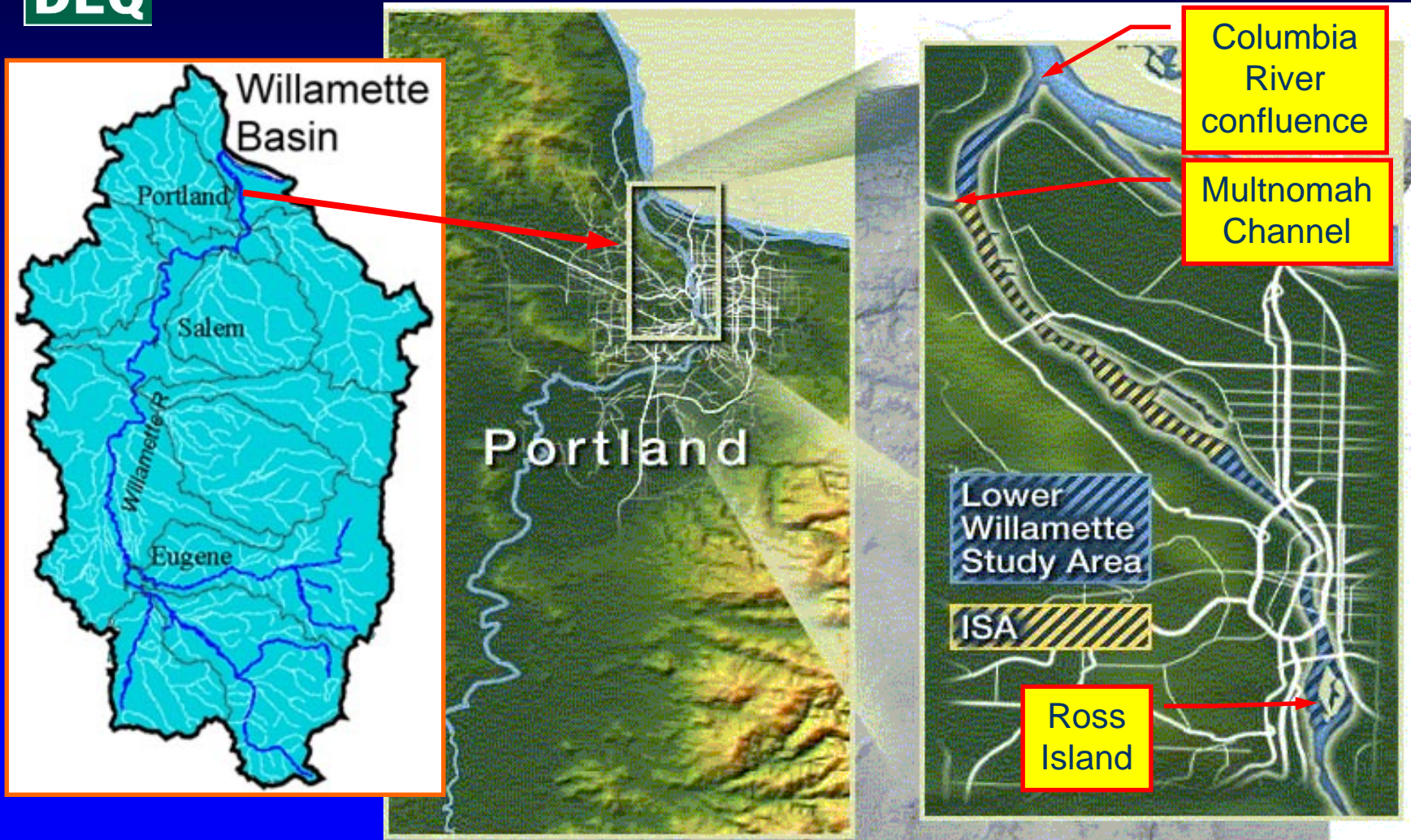


Estimating Contaminated Stormwater Impacts in Portland Harbor (Oregon)

Bruce K. Hope
Oregon Department of Environmental Quality
Portland, Oregon

2008 Annual Conference
Air & Waste Management Association
Portland, Oregon
June 2008

Portland Harbor Geography





Stormwater Questions

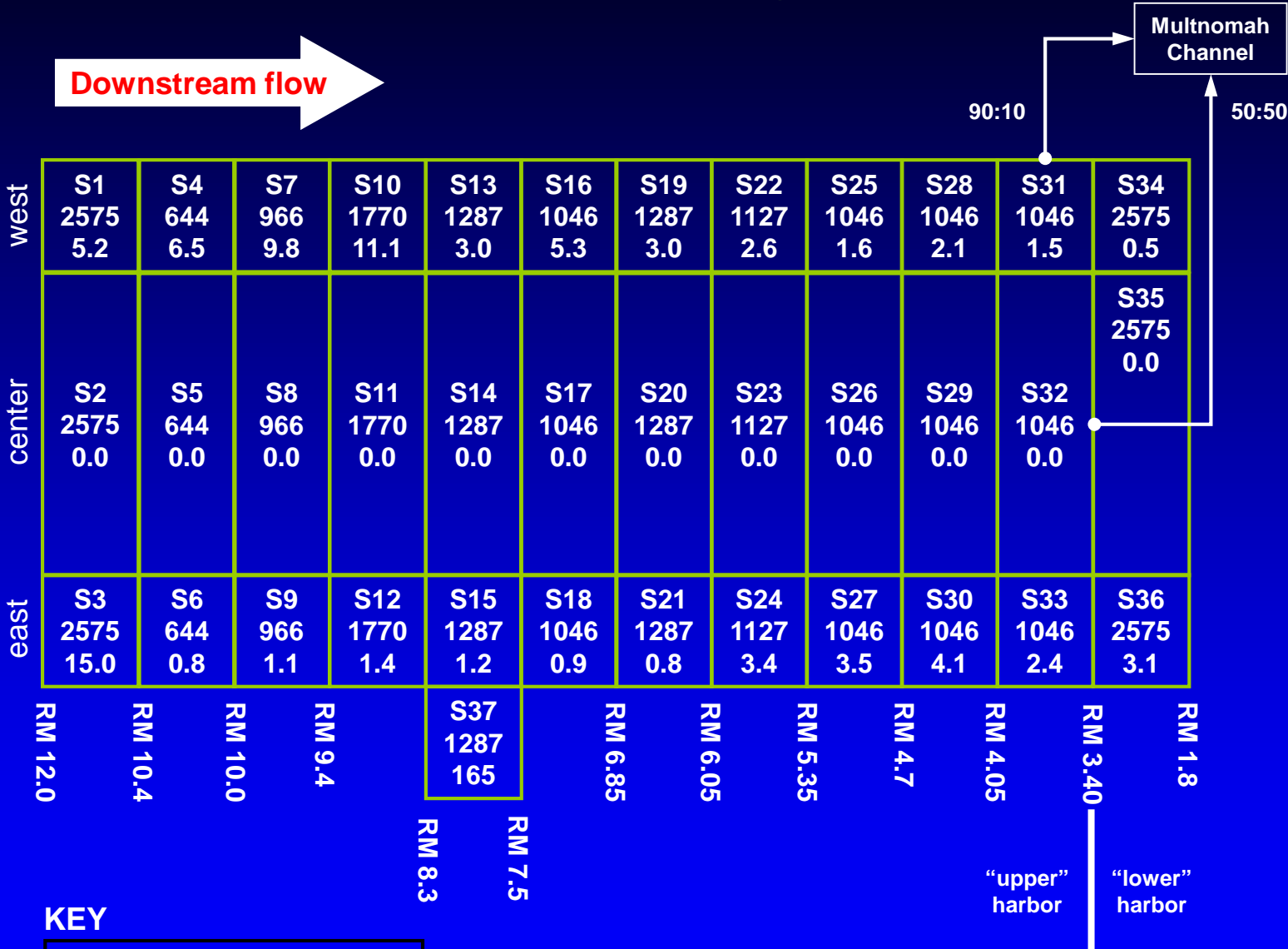
- What impact do upstream loads have on fish and sediment?
- What impact do stormwater loads have on fish and sediment?
- What impact do sediment loads have on fish and sediment?
- How do these different loads interact?



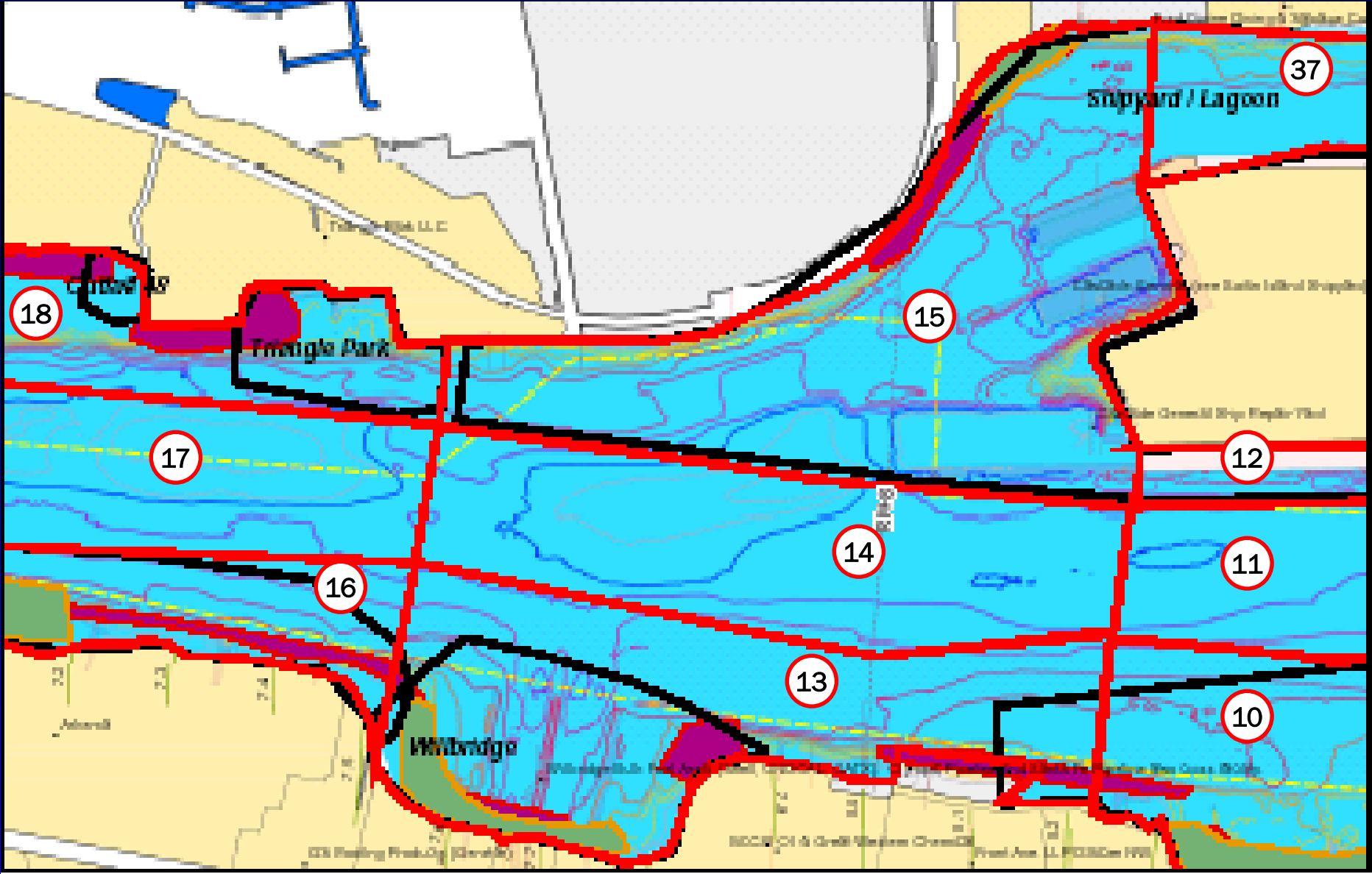
Address these questions by...

- Dividing Harbor into segments
- Organizing observed data by segment
- Introducing stormwater load by segment
- Using dynamic T&F and food web models
- Evaluating different combinations (“scenarios”) of upstream, stormwater, sediment loadings

Segmentation of Portland Harbor (37 segments)

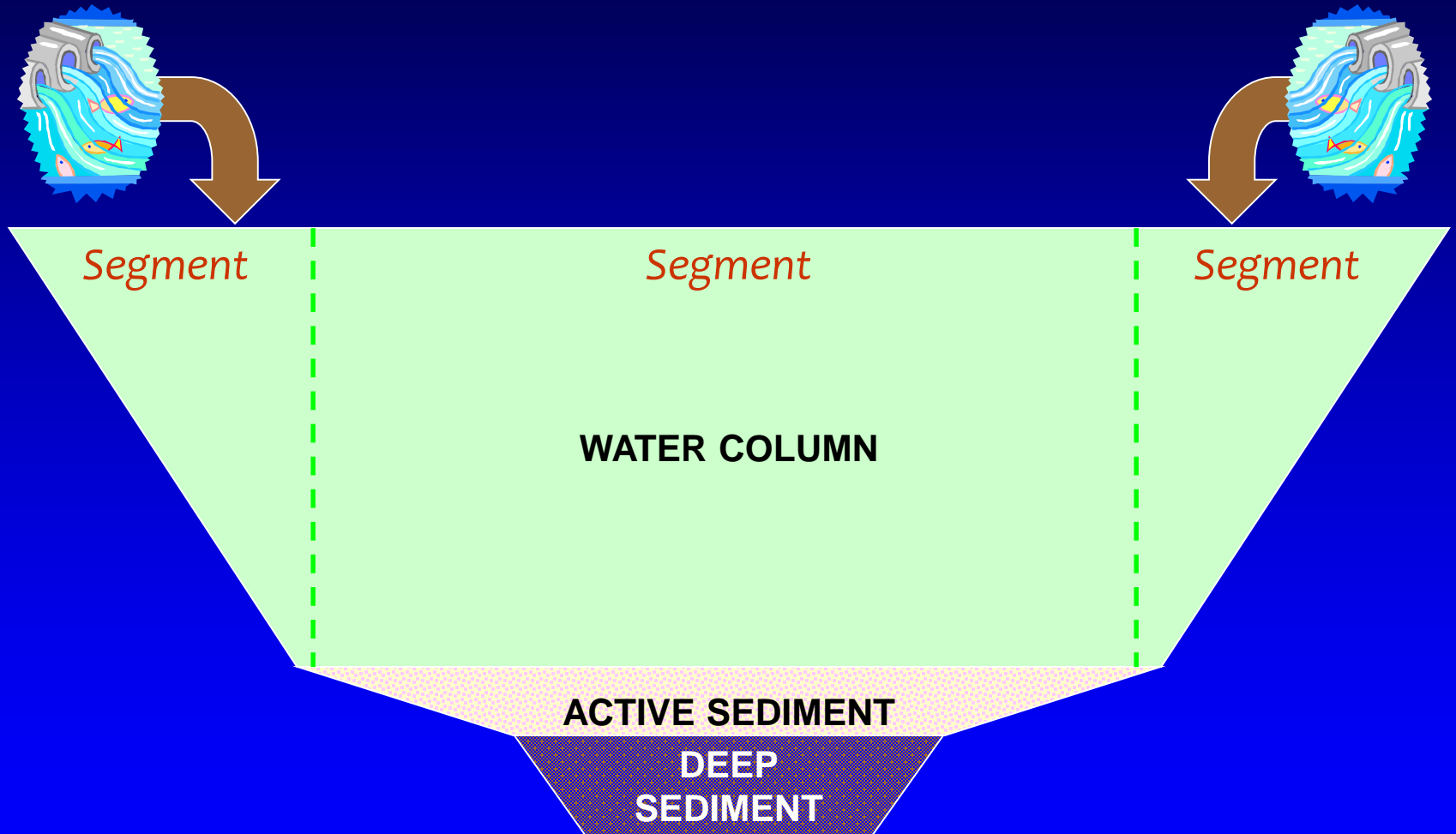


Mapping Segments to Physical River





Conceptualizing Stormwater Inputs



Spatial Distribution of Stormwater Inputs

FRACTION OF TOTAL
STORMWATER FLOW

16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%

1-3

4-6

7-9

10-12

13-15
37

16-18

19-21

22-24

25-27

28-30

31-33

34-36

SEGMENTS

West

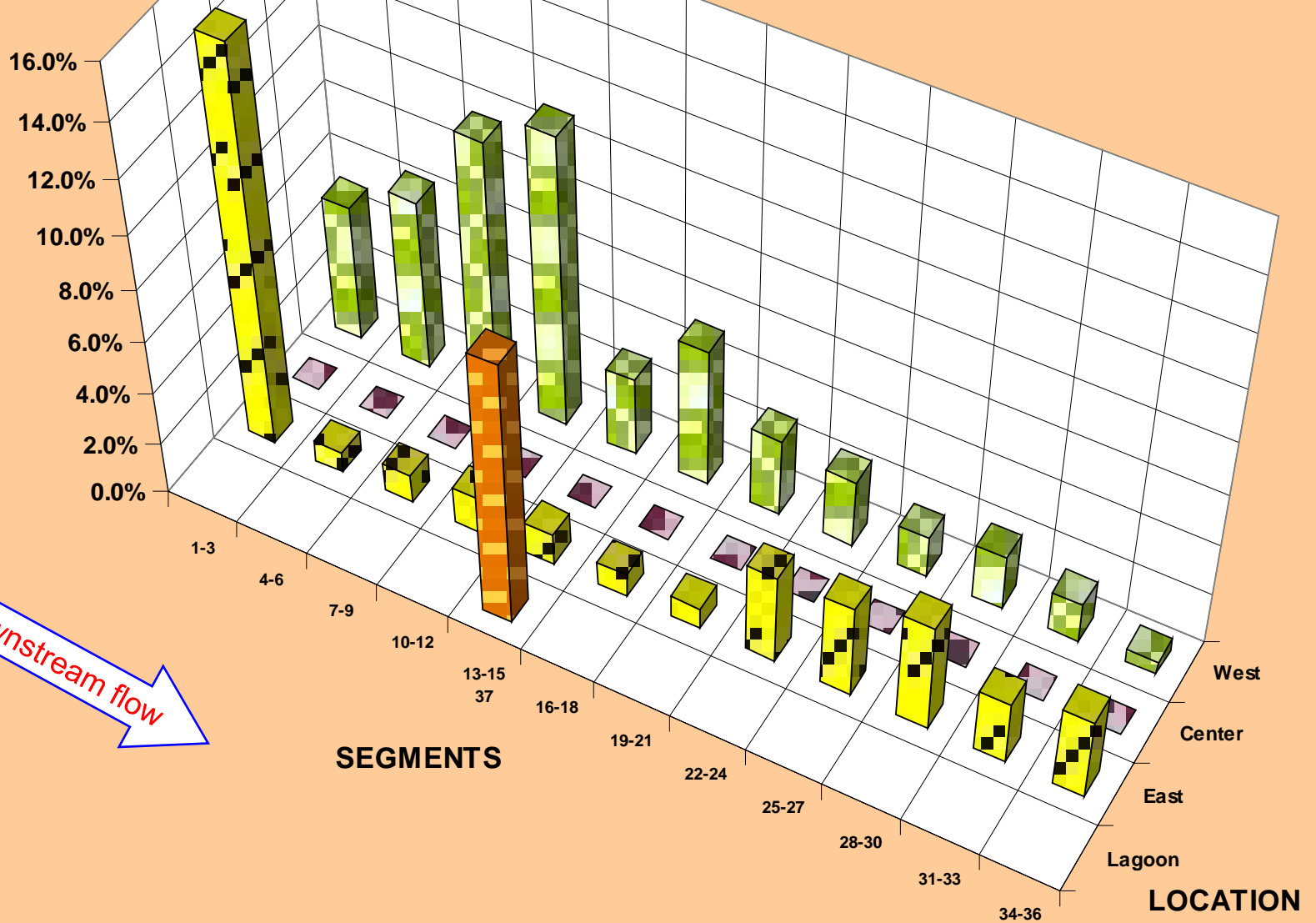
Center

East

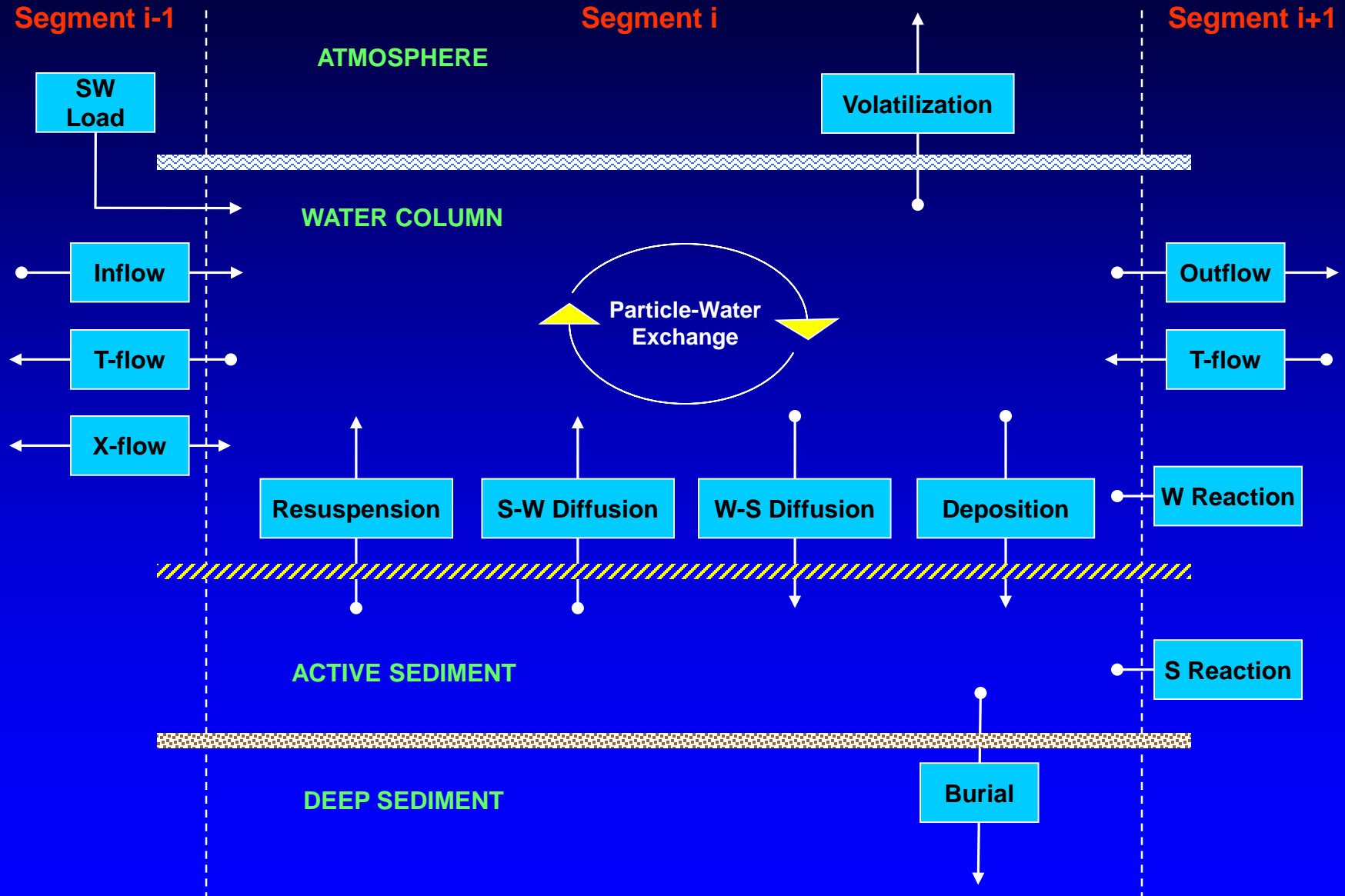
Lagoon

LOCATION

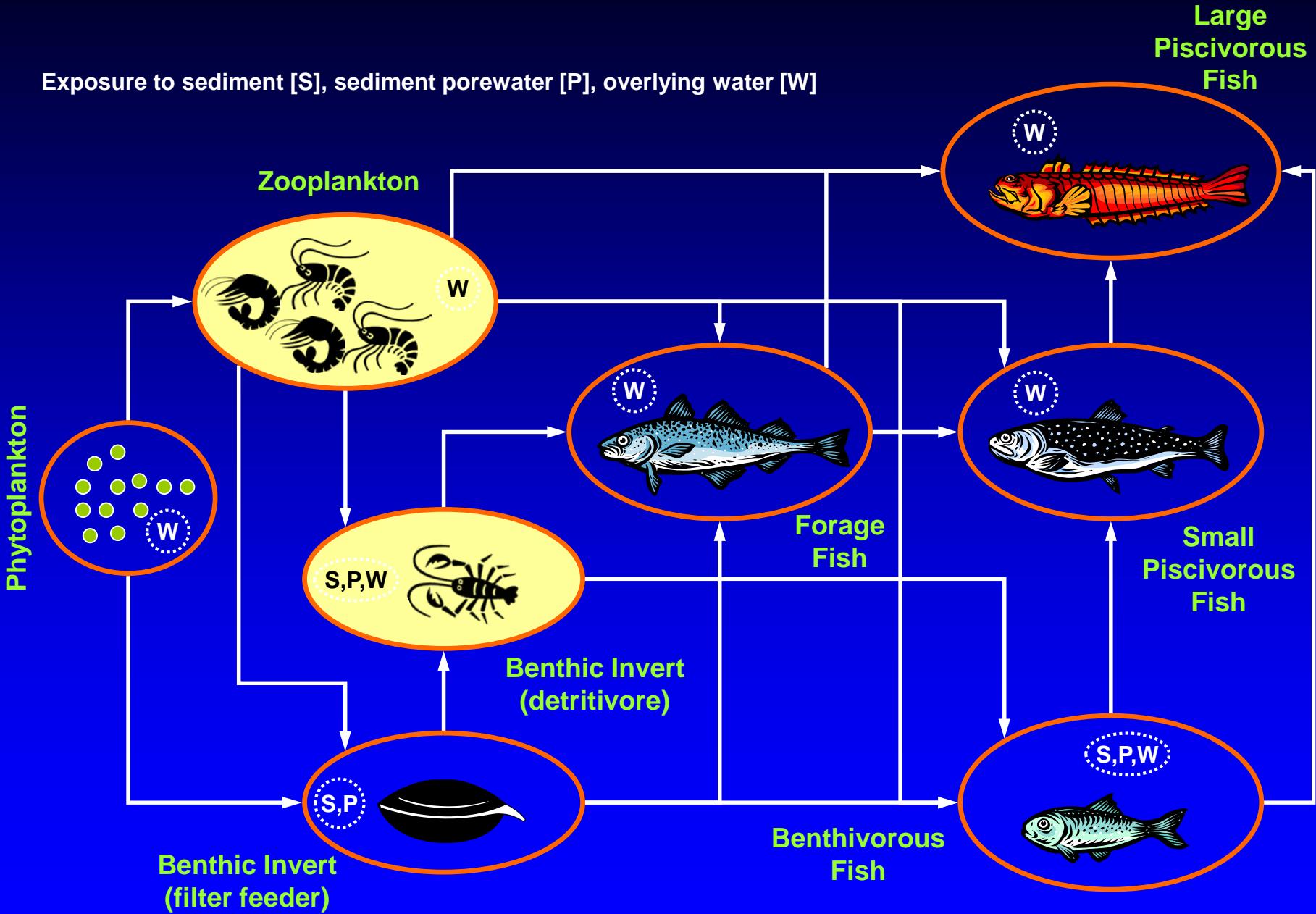
Downstream flow



Transport & Fate Model for a River Segment



Food Web Model





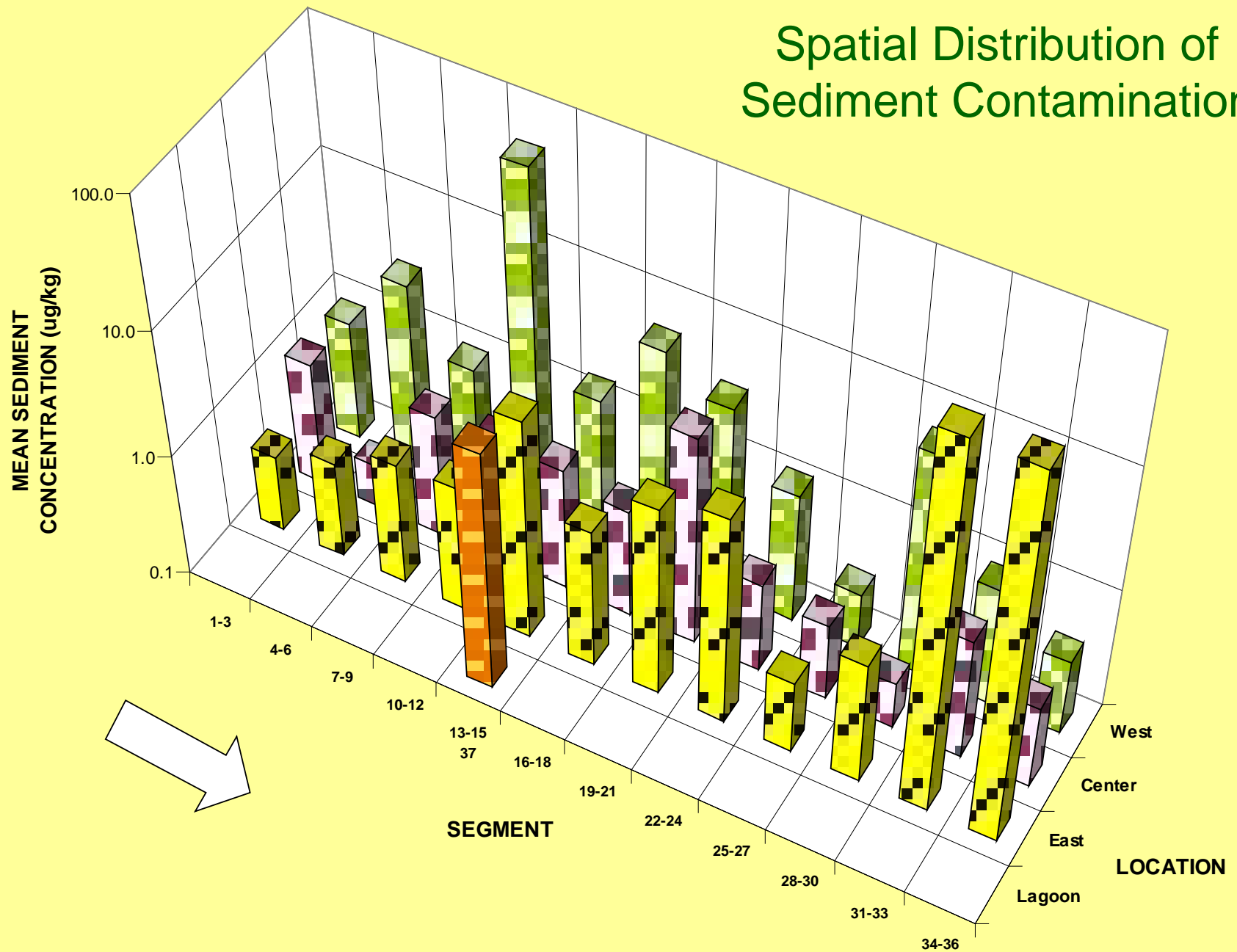
Scenarios evaluated

SCENARIO #	Upstream Input *	SW Input	Sediment Load
1	YES	NO	NO, CST = 0 [†]
2	YES	YES	NO, CST = 0
3	YES	YES	YES, CST = 0.012
4	YES	NO	YES, CST = 2.86
5	YES	YES	YES, CST = 2.86
6	YES	NO	YES, CST = observed
7	YES	YES	YES, CST = observed

* PCB-118 upstream mean concentration = 14 pg L⁻¹

[†] CST = total sediment concentration, µg kg⁻¹

Spatial Distribution of Sediment Contamination

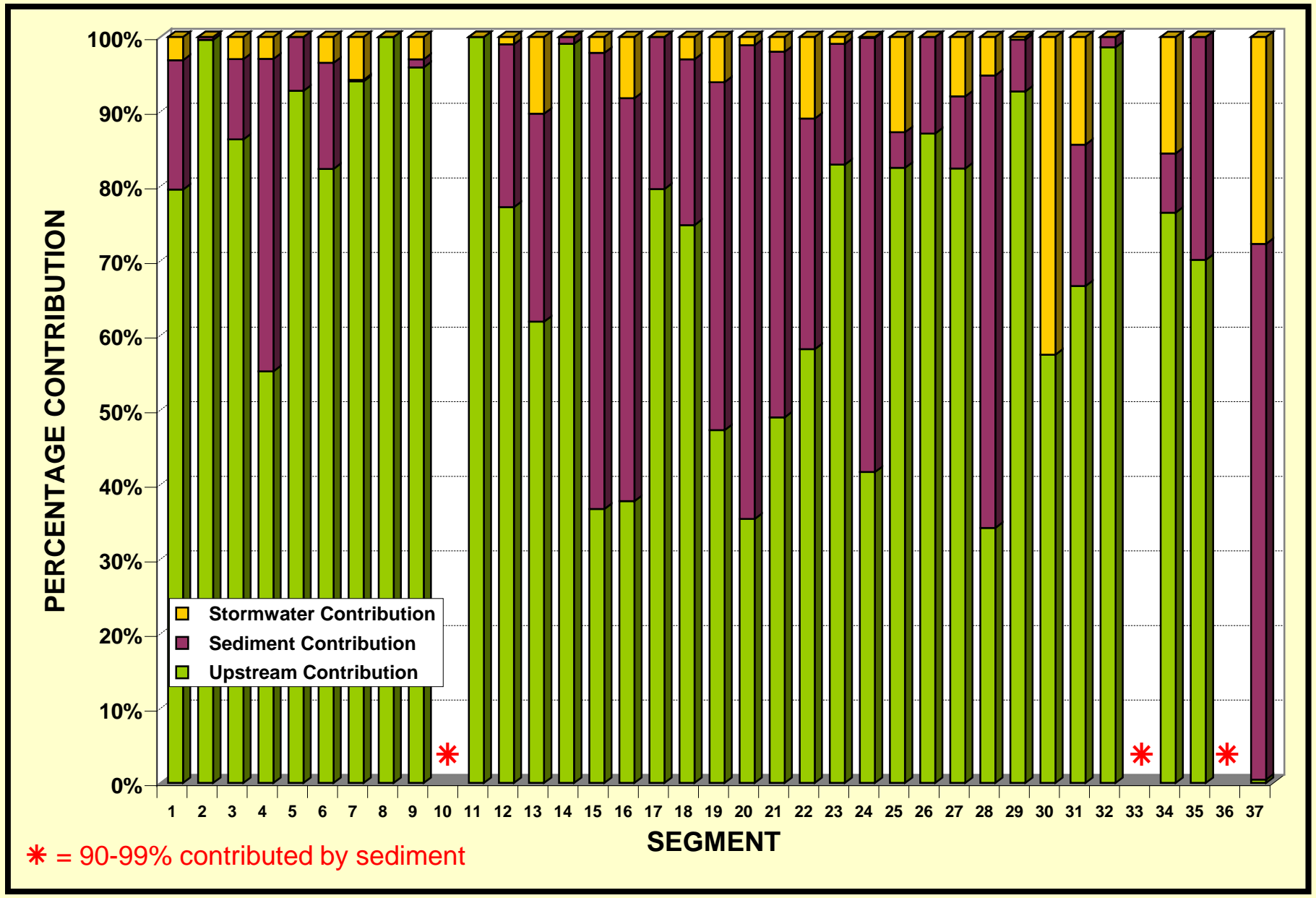




Results (1)

- For PCB-118
- Harbor-wide average contributions to fish tissue
 - ◆ Sediment: 85.3%
 - ◆ Upstream sources: 12.8%
 - ◆ Stormwater inputs: 1.9%
 - *May have greatest impact in Lagoon (Segment 37)*
- Contribution by source varies substantially by segment

Contributions to Fish Tissue by Segment





Results (2)

- For PCB-118
- Harbor-wide, legacy sediment contamination is dominant source for fish
 - ◆ But not all segments are equally impacted by contaminated sediment
- For some contaminants, upstream load may keep fish near advisory levels, regardless of sediment

Fish Tissue vs. Sediment Concentrations

